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USE OF MODIFIED GELATIN

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[Abstract]

Gelatin modified with dodecenylsuccinic acid is used for the production of inkjet paper.

Description

Up no now, synthetic polymers have been predominantly used for the coating of inkjet papers. Attempts to produce such coatings from gelatin or mixtures of plastics and gelatins have not led to the desired optimized characteristics. As is known from the literature, the

characteristics of the ink-receiving layer can be improved by derivatization of the gelatin and/or admixture of additives, such as polyalkylene oxides (see US Patent No. 4, 946,741). Up to now, for example, derivatives of gelatin have been used with phthalic acid, succinic acid, or maleic acid for inkjet coating. However, these derivatives are not completely miscible with all polymers and/or other additives. As a whole, therefore, it must be stated that the hitherto attained results have not been satisfactory.

What is desired, for example, for a high-quality glossy inkjet paper, on which inks also containing organic solvents, such as glycols, in addition to water, can be used, is for a homogeneous surface to be formed, without any cracks on the printed surfaces, for the printout to be color-fast, for the coating not to be tacky and to have a short drying time, and for the ink drops not to flow together to form larger units, which leads to a spotty appearance of the colored area. Finally, the production should be easy, reproducible, and low-cost.

The goal to fulfill all aforementioned requirements was always attained only in part with hitherto used formulations or derivatized gelatins and mixtures with various additives.

It was then discovered that the complex goal described above can be achieved by using gelatins modified with alkylene succinic acids as a component of the ink-receiving layer for inkjet printers. Preferably, a gelatin which is modified with dodecenylsuccinic acid is used.

The modified gelatins, used in accordance with the invention, are preferably obtained by reacting the gelatin with alkylene succinic anhydride in aqueous solution at elevated temperatures and with a pH value in the range of 8 to 9. After reacting, these reaction batches are preferably neutralized or rendered weakly acidic.

Particularly good results are attained, if the gelatin modified with alkylene succinic acid contains one or more wetting agents. Suitable in principle are nonionic, cationic, or amphoteric wetting agents. Particularly good results are attained with nonionic surfactants, which contain polyoxyethylene groups.

The object of the invention under consideration is thus the use of a gelatin, modified with alkylene succinic acid, as a component of the ink-receiving layer of inkjet printers or expressed in another manner, the method for the production of the ink-receiving layer of inkjet printers, characterized in that it includes a gelatin modified with alkylene succinic acid.

Gelatin is a polypeptide, produced in large quantities, which is formed by acid, alkaline, or enzymatic degradation of collagen fibers, in particular bone and skin collagen. Its molecular weight can be indicated as ca. 30,000 to 300,000 g/mol, according to Ward (A. G. Ward and A. Courts, The Science and Technology of Gelatin). Gelatin is able to react with reactive compounds, such as aldehydes and acid anhydrides, among other reasons, because of free hydroxyl groups and amino groups. The reaction with aldehydes leads, for example, to crosslinking, which is also called curing. The reaction with acid anhydrides also leads to a

change in characteristics, in particular, to an improvement of chemical and thermal stability. Thus, for example, for certain gelatin capsules, a gelatin reacted with succinic anhydride, a so-called succinylated gelatin, is used. This modified gelatin is, for example, resistant against aldehyde group-containing active substances.

If during the production of the inkjet coating, gelatins or their derivatives were used, these were phthalylated, succinylated, or maleinated gelatin. These gelatin derivatives exhibit an increased hydrophilicity, in comparison to unmodified gelatin.

In contrast to this, the reaction of gelatin with alkylene succinic anhydrides leads to a certain hydrophobicization and to a better miscibility with many polymers and the most varied additives, which may be necessary for the production of a good inkjet coating.

Alkylene succinic acids or their anhydrides can be produced by an Ene reaction of unsaturated hydrocarbons with maleic anhydride. Suitable in principle for this reaction are alkylene groups with 4 to 25 carbon atoms. Preferably, alkylene succinic acid radicals are used, whose alkyl groups have 8 to 16 carbon atoms. Preferably, dodecenylsuccinic acid is used, since it is low-cost and can be obtained in large quantities and with it, excellent results are attained in the production of inkjet paper.

The invention is explained in more detail in the following examples.

Example 1

Production and characteristics of the gelatin

6 kg gelatin are stirred into 22 L water preheated to 70°C and after complete dissolution with sodium hydroxide, the mixture is adjusted to a pH value of 8.5. 640 g dodecenylsuccinic anhydride (0.04 mol/100 g) are metered in within 30 min, wherein the pH value is subsequently regulated to 8.5 by the addition of 50% NaOH. After the addition has ended, stirring is carried out for another 60 min at 70°C and pH 8.5. Then, the pH value is adjusted to pH 6.0 by the addition of glacial acetic acid. This mixture is poured out into layers 5 cm high and after the gelling is comminuted and dried at 30°C and ambient moisture. The product thus obtained has a dry content of 90.8%. The viscosity is 22.54 mPa·s. The IIP (isoionic point) is 5.0. The degree of conversion (glutaraldehyde) is 92%. The conductivity is 6.51 mS and the transmission is 94.15% at 620 nm. The transmission is still 83.50% at 450 nm.

Example 2

Production of the inkjet coating

For the production of the coating solution, 5 g of the gelatin mentioned above and 1.5 g wetting agent (Crovol A 40, Croda GmbH or Tween 80, ICI) are filled to 50 g with water. After swelling, dissolving at 60°C and pH correction to 7, the solution is briefly degassed in an

ultrasonic bath at 50°C. Subsequently, coating is carried out by applying with a doctor (75 µm) onto a substrate. Coronized polyethylene-coated paper was used as the substrate. The coated substrate was dried at approximately 70°C and 30% relative humidity.

An additional noncurl layer of the reverse of the substrate was not required.

Example 3

Printer results

For the evaluation of the printer results, a commercial high-gloss printer production paper was used as a reference (Epson Stylus Color 11), which does not contain any gelatin derivatives, is relatively expensive, but at present, is the best paper obtainable. The relative deviations of the drying time, the homogeneity, the gloss, the color-fastness, the tackiness, and the resolution were evaluated according to a note scale. The paper, in accordance with the invention, can be produced, at least with regard to essential points (for example, gloss and resolution), in at least equivalence and in a simple and low-cost manner.

Claims

1. Use of gelatin modified with alkylene succinic acids as a component of the ink-receiving layer for inkjet printer.

2. Use according to Claim 1, characterized in that the gelatin is modified with dodecenylsuccinic acid.

3. Use according to Claim 1 or 2, characterized in that the modified gelatin was obtained by reacting the gelatin with alkylene succinic anhydride in aqueous solution at an elevated temperature and with a pH of 8-9.

4. Use according to one of Claims 1-3, characterized in that the gelatin contains one or more wetting agents.

5. Use according to Claim 4, characterized in that nonionic surfactants with polyoxyethylene groups are used.

6. Method for the production of the ink-receiving layer for inkjet printers, characterized in that gelatin modified with alkylene succinic acid is used.

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